



AEROSPACE RECOMMENDED PRACTICE

ARP785™**REV. B**

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Superseding ARP785A

(R) Procedure for the Determination of Particulate Contamination
in Hydraulic Fluids by the Control Filter Gravimetric Procedure

RATIONALE

The document has been significantly updated to make it reflect current practices, and two new appendices have been introduced to detail procedures that are referenced in the document.

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Documents

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1. SCOPE

This ARP describes a gravimetric method for the determination of particulate contaminant in hydraulic fluids by the control filter technique.

NOTE: With this method, detectable contamination levels down to 0.2 mg (7.0×10^{-6} ounces) per sample can be obtained with a standard deviation of ± 0.1 mg ($\pm 3.5 \times 10^{-6}$ ounces).

2. REFERENCES

2.1 APPLICABLE DOCUMENTS

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained.

2.1.1 SAE Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or +1 724-776-4970 (outside USA), www.sae.org.

ARP5376 Methods, Locations And Criteria For System Sampling And Measuring The Solid Particle Contamination Of Hydraulic Fluids

2.1.2 ISO Publications

Copies of these documents are available online at <http://webstore.ansi.org/>.

ISO 384 Laboratory glass and plastics ware - Principles of design and construction of volumetric instruments

ISO 3722 Hydraulic fluid power - Fluid sample containers - Qualifying and controlling cleaning methods

ISO 4021 Hydraulic fluid power - Particulate contamination analysis - Extraction of fluid samples from lines of operating system

ISO 4405 Hydraulic fluid power - Fluid contamination - Determination of particulate contamination level by the gravimetric method

ISO 4788 Laboratory glassware - Graduated measuring cylinders

2.2 Definitions

GRAVIMETRIC PROCEDURE: Gravimetric analysis describes a method for the quantitative determination of contaminant in a system based on the mass of contaminant measured.

TARE WEIGHT: The tare weight of a filter is its initial weight as received after equilibration to ambient room conditions.

3. OUTLINE OF METHOD

Total particulate contamination, including both organic and inorganic material, is determined by filtering a quantity of hydraulic fluid through a pre-weighed, 47.0 mm (1.85 inches diameter), 0.8 μm (3.14×10^{-5} inches) membrane filter; solvent flushing to remove filter retained fluid; oven drying followed by equilibration with ambient room conditions; then a final weighing.

In addition, a control filter is carried through the analysis in order to control and correct for test variables and possible sources of error. The control filter is subjected to the same procedures as each test filter with the exception of actual contaminant filtration, thereby serving as an indicator of any changes in balance calibration, changes in filter weights resulting from moisture content change (humidity variation), desorption of filter extractable, or absorption of hydraulic fluid constituents. A further function of the control filter is to provide a blank analysis run concurrently with the actual test sample.

4. SOLVENTS/REAGENTS

Solvents/reagents should be used with gravimetric contamination levels less than 0.1 mg/L (1.2×10^{-5} oz/gal) and compatible with the fluid being analyzed and filter membrane disc. It is important that solvents and hydraulic fluid do not react with filter membrane disc which would provide erroneous results using this procedure.

The following solvents are suggested (or other suitable solvents with similar properties) for hydraulic fluids, but they should be verified and documented using the test procedure in Appendix A before use:

1. Analytical Grade Petroleum Ether or Hexane (analytical grade with less than 0.1 mg/L (1.2×10^{-5} oz/gal) of solid contaminants) 30 to 60 °C (86 to 140 °F) Boiling Point or Analytical Grade Hexane or VM & P Naphtha should be used. The text should use the term "Petroleum Ether." It is a regulated chemical.

CAUTION: These fluids are flammable and not environmentally friendly.

2. Reagent Grade Isopropyl Alcohol (Acetone Free - Analytical grade with less than 0.1 mg/L (1.2×10^{-5} oz/gal) of solid contaminants). It is a regulated chemical.

CAUTION: This fluid is flammable.

3. Heptane (analytical grade with less than 0.1 mg/L (1.2×10^{-5} oz/gal) of solid contaminants). It is a regulated chemical.

CAUTION: This fluid is flammable.

5. APPARATUS

5.1 Expendable Materials

Membrane filters, 47 mm (1.85 inches diameter), 0.8 μ m (3.14×10^{-5} inches) pore size or finer, water extractables 5% maximum. Industry standard membranes of 0.45 μ m (1.77×10^{-5} inches) pore should be acceptable as long as they are compatible with the fluids used.

5.2 Nonexpendable Equipment

These are the following:

1. A borosilicate glass filter holder assembly, 47 mm diameter, (1.850 inches) with a funnel approximately 300 mL (10.144 fluid ounces) capacity - pre-washed.
2. A side arm filter flask for collecting samples 1 L (35 fluid ounces) volume.
3. A vacuum pump or aspirator, capable of drawing 25 in Hg (12.27 psi) vacuum pressure.
4. Stainless steel flat-bladed forceps with un-serrated tips.
5. An analytical or electronic balance capable of weighing to 0.05 mg (1.7×10^{-6} ounces) sensitivity and accuracy of 0.05 mg (1.7×10^{-6} ounces).

NOTE: Place a porous or open container holding desiccant granules into the balance case to maintain low relative humidity.

6. Covered glass Petri dishes, 150 mm (5.90 inches) diameter.